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Engineering Dept.,  
New York.

( 6 Pages) Page #1.  
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## METHOD OF OPERATION

### CORD CIRCUIT

Sender Monitoring Position - With Coin Collect Feature - Arranged to Provide Talking Battery to Subscribers When Required - Trouble Desk - Full Mechanical Power Driven System.

### GENERAL DESCRIPTION

1. This circuit is used in a mechanical exchange at the sender monitoring position with time measure and monitoring alarm circuits whose sleeves are grounded through a maximum resistance of 1050 ohms, and with plugging up line circuits whose sleeves are connected directly to ground and to ground through 1050 ohms. The circuit is arranged to provide talking battery to subscribers, when required; to give supervision at the sender monitor's position on all connections; to trip machine ringing without operating the message register of the calling subscriber; to flash on manual connections, and for coin collect and refund. The circuit is arranged so that in the event the operator flashes through error on a call originating at a mechanical office, the subscriber will not be charged.

### DETAILED DESCRIPTION

#### SENDER TEST

2. When the plug of the cord is inserted in the test jack of a sender in answer to a lighted sender lamp, the MG relay does not operate due to the high resistance of the sender jack sleeve circuit, but the SLV relay operates and lights the supervisory lamp. If a subscriber's station is connected to the line, or ring side of the line is grounded, or the line is short circuited, a circuit is closed from battery through the  $\frac{1}{4}$  ohm winding of the S relay, break contact of the MG-1 relay, winding of the repeating coil, over the ring side of the line, through the direct current bridge, to ground and in the former case back over the tip side of the line, through the repeating coil, and the break contact of the MG-1 relay to ground, operating the S relay, extinguishing the supervisory lamp. When the plug of the cord is withdrawn from the test jack, the SLV relay releases restoring the circuit to normal.

#### INCOMING FROM LONG DISTANCE

3. If the cord is used in connection with long distance trunks, the plug of the cord is inserted in the switchboard jack of a plugging up line operating the SL and MG relays in series. The operation of the SLV relay lights the cord supervisory lamp. The operation of the MG relay closes a circuit from ground on its armature, through its make contact, to battery through the winding of the MG-1 relay, which operates and closes a circuit from battery through the ~~250~~<sup>500</sup> ohm winding of the S relay, make contact of the MG-1 relay, winding of the repeating coil, over the tip side of the cord and trunk, to ground in the long distance trunk circuit operating the S relay. The oper-

ation of the S relay extinguishes the supervisory lamp. When ground is disconnected from the tip side of the long distance trunk, the S relay releases in turn lighting the supervisory lamp as a disconnect signal. When the plug of the cord is withdrawn from the trunk jack, the SL and MG relays release, in turn releasing the MG-1 relay and restoring the circuit to normal.

INCOMING FROM LOCAL:

4. When the plug of the cord is inserted in the switchboard jack of a plugging up line in answer to an incoming call, the SL and MG relays operate. The SL relay operated, closes a circuit to light the supervisory lamp from battery through the lamp, make contact of the SL relay, to ground on the break contact of the S relay. The MG relay operated, closes circuit through the winding of the MG-1 relay which operates, and also removes the short circuit from the 18-AF resistance.

5. The talking key should be adjusted so that the make contact springs "A" should make before contact B. When the talking key is operated, a circuit is closed from battery through the operating winding of the TP relay, break contact of the CO relay, make contacts (B) of the listening key, to ground on the make contact of the S relay, causing the TP relay to relay to operate. The operation of the TP relay closes a circuit for the TP-1 relay to operate under control of the interrupter. This circuit is traced from battery through the winding of the TP-1 relay, break contact of the TP-2 relay, make contact of the TP relay make contact of the interrupter to ground on the break contact of (F) relay. The TP-1 relay operated, short circuits the TP-2 relay from ground on the armature of the TP relay, through its make contact, make contact of the TP-1 relay, to one side of the winding of the TP-2 relay, the other side of the winding being connected to ground on the make contact of the interrupter. When the contacts on the interrupter open, ground is removed from one side of the winding of the TP-2 relay, causing it to operate in series with the TP-1 relay. The operation of the TP-2 relay closes a circuit from ground on the interrupter through its armature and make contact, break contact of the CO relay, make contact of the SLV relay, to battery through the winding of the CN relay which operates at the next "make" of the contacts of the interrupter. The operation of the CN relay connects the 300 ohm 18-AF resistance across the tip and ring of the cord, tripping the machine ringing current in the selector circuit. The operation of the CN relay also closes a circuit from ground on the armature and make contact of the TP-2 relay, make contact of the CN relay to battery through the winding of the TF relay which operates. When the contact of the interrupter breaks, the CN relay releases, but the TF relay does not release, being held operated in a circuit traced from battery through the winding and make contact of the TF relay, break contact and winding of the CO relay, to ground on the make contact of the SLV relay, causing the CO relay to operate. The CO relay operated locks to battery on its armature through its make contact. It also closes a holding circuit for the TF relay which is traced from ground on the make spring of the talking key, through 500 ohm 18-AC resistance, make contact of the CO relay, to battery through the winding of the TF relay. The operation of the CO relay opens the holding circuit through the TP relay,

which releases in turn releasing the TP-1 and TP-2 relays, and transfers the ground on the armature and make contact of the S relay, to the sleeve lead of the operator's telephone circuit.

6. If it is desired to flash over a trunk to a manual office, the flashing key is operated and released in the usual manner. With the first operation of the flashing key, ground is connected through the make contacts of the key, to battery through the winding of the F relay which operates. The F relay is made slow to release in order to give a uniform flash on the supervisory lamps in the manual office. The operation of the F relay closes a circuit from ground on the make contact and armature of the F relay, through the make contact of the TF relay to battery through the winding of the CN relay which operates. The operation of the CN relay disconnects the tip and ring of the cord from the repeating coil and connects them to the 300 ohm 18-AF resistance. As the key is operated and released, the bridge across the tip and ring of the cord is made and broken, causing the supervisory relay at the distant end of the connection to flash the supervisory lamp. If the flashing key is normal, the CN relay is held operated due to the slow release of the F relay. When the flashing key is in the operated position, the tip and ring of the cord is connected through the make contacts of the CN relay, the make contacts of the flashing key, to the TF and RF leads of the operator's telephone circuit, thereby allowing the operator to hear the distant operator's challenge.

7. The maximum period during which the 18-AF resistance can remain across the line is equal to the time required to release the F relay. This period is not sufficient to make a charge on a call originating in a mechanical office in case the operator, through error, should flash on a mechanical connection.

#### COIN COLLECT AND COIN REFUND

8. To collect a coin, the CC key is operated closing a circuit from ground through the contact of the key, to battery through the winding of the CN relay which operates. The operation of the CN relay, the coin collect key being operated, connects 110 volts positive battery to the tip and ring of the cord and line operating the coin collect magnet in the subscriber's set. The coin is returned, by operating the coin refund key, operating the CN relay as before, but connecting 110 volt negative battery to the tip and ring of the cord. This circuit is traced from 110 volts battery through the contacts of the coin refund key, the make contact of the CN relay and over the tip side of the cord, the circuit on the ring side of the cord being closed through the make contact of the flashing key, the 118-AF resistance, make contact of the CN relay to the ring side of the line. The CN relay is made slow in releasing so that when the coin collect or coin return circuit is opened, the arcing will take place at the key contacts rather than at the relay contacts. The 19-BF resistance and 2 M.F. condenser are provided to absorb the spark when the circuit is opened at the relay contacts in the subscribers set upon the collection or return of the coin.

( 6 Pages) Page #4.  
Issue 2 - BT-431459.  
Replacing all previous issues.  
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9. When the talking key is restored to normal, and the plug of the cord withdrawn from the jack of the trunk, all operated relays are released and the circuit is restored to normal.

( 6 Pages) Page #5.  
 Issue 2 - BT-431459.  
 Replacing all previous issues.  
 August 2, 1921.

# CIRCUIT REQUIREMENTS

	<u>OPERATE</u>	<u>NON-OPERATE</u>	<u>RELEASE</u>
B164 (S) (Inner 7 ohms)	After a soak of ap- proximately .100 amp. Test .021 amp. Readj. .014 amp.		After a soak of ap- proximately .100 amp. Test .0034 amp. Readj. .0036 amp.
Outer 250 ohms	Test .0195 amp.		
E23 MG-1	Test .028 amp. Readj. .016 amp.	Test .011 amp. Readj. .012 amp.	
E114 TP-1	Test .015 amp. Readj. .0099 amp.		Test .0016 amp. Readj. .0032 amp.
E206 (TF)	Test .022 amp. Readj. .016 amp.		Test .0015 amp. Readj. .003 amp.
E214 (TP-2)	Test .018 amp. Readj. .015 amp.	Test .009 amp. Readj. .010 amp.	
E385 (SLV)	Through relay wind- ing; Readj. .0147 amp.  Through sleeve of cord: Test .030 amp. Readj. .028 amp.		Through relay wind- ing; Readj. .002 amp.  Through sleeve of cord: Test .0019 amp. Readj. .0038 amp.
E538 (CO)	Test .025 amp. Readj. .021 amp.	Test .011 amp. Readj. .012 amp.	
NOTE:- Adjust straight outside spring of the make-break combination to give at least 20 grams pressure against its back con- tact spring.			
E660 MG	Through relay wind- ing; Readj. .038 amp.  Through sleeve of cord: Test .087 amp. Readj. .073 amp.	Through relay wind- ing; Readj. .027 amp.  Through sleeve of cord: Test .048 amp. Readj. .052 amp.	

( 6 Pages) Page #6.  
Issue 2 - BT-431459.  
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CIRCUIT REQUIREMENTS

	<u>OPERATE</u>	<u>NON-OPERATE</u>	<u>RELEASE</u>
E663	Test .040 amp.	Test .020 amp.	
CN	Readj. .038 amp.	Readj. .022 amp.	
E691	Test .030 amp.		Test .0015 amp.
(TP)	Readj. .024 amp.		Readj. .005 amp.
(Inner			
500 ohms)			
(Outer	Hold:		
500 ohms)	Test .040 amp.		
149-P	Shall operate and	Shall operate and re-	
(F)	hold when the cur-	lease (follow the pulses)	
	rent through the	when current through the	
	relay winding is in-	relay winding is in-	
	terrupted on 1/3	terrupted on 1/2 second	
	second make and 1/3	make and 1/2 second	
	second break time	break time intervals.	
	intervals.		
	Test .019 amp.	Test .018 amp.	
	Readj. .018 amp.	Readj. .018 amp.	

The above circuit interruptions may be obtained by using Relay  
Test Circuit T-438798.

ENG.---JLS-JO.  
8/7/22.

CHK'D.--WCD-CWP.

APPROVED - C.L. SLUTTER, G.M.L.

CW & T series sleeve  
T con. to set to 7 & 8  
disc TP fr. 7 & 8